Claims

1. An apparatus for transmitting an optical signal comprising:

an optical signal source for generating an optical signal onto which data is modulated at a predetermined frequency;

an amplitude modulator coupled to the optical signal source for modulating the intensity of said data modulated signal; and

a clock coupled to the amplitude modulator having a frequency that determines the modulation frequency of the amplitude modulator, said frequency of the clock being phase locked and equal to said predetermined frequency.

2. The apparatus of claim 1 wherein the optical signal source includes a continuous-wave optical signal generator and a data source, said clock being coupled to the data source for establishing the predetermined frequency at which data is modulated onto the optical signal.

3. The apparatus of claim 1 wherein the amplitude modulator modulates the amplitude of the data modulated optical signal at said predetermined frequency with a prescribed phase, and further comprising an electrical variable-delay line coupling said clock to said amplitude modulator for selectively varying the prescribed phase.

4. The apparatus of claim 3 wherein said electrical variable-delay line is a phase shifter.

5. The apparatus of claim 1 wherein said amplitude modulator includes means for selectively adjusting the degree of amplitude modulation that is imparted to said data modulated signal.

6. The apparatus of claim 1 further comprising a polarization modulator coupled to said amplitude modulator and said clock for modulating the state of polarization of said data modulated signal at said predetermined frequency such that an average value of the state of polarization over a modulation cycle is substantially equal to zero.

7. The apparatus of claim 6 wherein said polarization modulator modulates the state of polarization by tracing the polarization of said optical signal along at least a portion of a Poincaré sphere.

8. The apparatus of claim 6 wherein the polarization modulator modulates the state of polarization of the optical signal at said predetermined frequency with a prescribed phase, and further comprising an electrical variable-delay line coupling said clock to said polarization modulator for selectively varying the prescribed phase.

9. The apparatus of claim 8 wherein said electrical variable-delay line is a phase shifter.

10. The apparatus of claim 6 further comprising an optical phase modulator coupling the optical signal source to the amplitude modulator, said optical phase modulator providing optical phase modulation to said data modulated signal while imparting substantially no polarization modulation thereto.

11. The apparatus of claim 10 wherein said clock is coupled to said optical phase modulator so that said optical phase modulator provides optical phase modulation at a frequency that is phase locked and equal to said predetermined frequency.

12. The apparatus of claim 11 further comprising a second electrical variable-delay line coupling said clock to said optical phase modulator for selectively varying the phase of said optical phase modulation provided by the optical phase modulator.

13. The apparatus of claim 12 wherein said second electrical variable-delay line is a phase shifter.

14. An apparatus for transmitting an optical signal comprising:

an amplitude modulator receiving an optical signal onto which data has been modulated at a predetermined frequency; and

a clock coupled to the amplitude modulator having a frequency that determines the frequency of the modulation cycle, said frequency of the clock being phase locked and equal to said predetermined frequency.

15. The apparatus of claim 14 wherein the amplitude modulator modulates the amplitude of the optical signal at said predetermined frequency with a prescribed phase, and further comprising an electrical variable-delay line coupling said clock to said amplitude modulator for selectively varying the prescribed phase.

16. The apparatus of claim 15 wherein said electrical variable-delay line is a phase shifter.

17. The apparatus of claim 14 further comprising a polarization modulator coupled to said amplitude modulator and said clock for modulating the state of polarization of said data modulated signal at said predetermined frequency such that an average value of the state of polarization over a modulation cycle is substantially equal to zero.

18. The apparatus of claim 17 wherein said polarization modulator modulates the state of polarization by tracing the polarization of said optical signal along at least a portion of a Poincaré sphere.

19. The apparatus of claim 18 wherein the polarization modulator modulates the state of polarization of the optical signal at said predetermined frequency with a prescribed phase, and further comprising an electrical variable-delay line coupling said clock to said polarization modulator for selectively varying the prescribed phase.

20. The apparatus of claim 19 wherein said electrical variable-delay line is a phase shifter.

21. The apparatus of claim 17 further comprising an optical phase modulator coupling the optical signal source to the amplitude modulator, said optical phase modulator providing optical phase modulation to said data modulated signal while imparting substantially no polarization modulation thereto.

22. The apparatus of claim 21 wherein said clock is coupled to said optical phase modulator so that said optical phase modulator provides optical phase modulation at a frequency that is phase locked and equal to said predetermined frequency.

23. The apparatus of claim 22 further comprising a second electrical variable-delay line coupling said clock to said optical phase modulator for selectively varying the phase of said optical phase modulation provided by the optical phase modulator.

24. The apparatus of claim 23 wherein said second electrical variable-delay line is a phase shifter.

25. A method for transmitting an optical signal comprising the steps of:
generating an optical signal onto which data is modulated at a predetermined frequency; and
modulating the amplitude of said data modulated signal at a frequency phase locked and equal to said predetermined frequency.

26. The method of claim 25 further comprising the step of selectively varying the phase of the amplitude modulation imparted to said data modulated signal.

27. The method of claim 25 further comprising the step of selectively phase modulating said data modulated signal while imparting substantially no polarization modulation to the optical signal.

28. The method of claim 27 wherein the step of selectively phase modulating said data modulated signal comprises the step of selectively phase modulating said data modulated signal at a frequency equal to said predetermined frequency at which data is modulated.

29. A transmission system comprising:
a transmitter, including
an optical signal source for generating an optical signal onto which data is modulated at a predetermined frequency;
an amplitude modulator coupled to the optical signal source for modulating the intensity of said data modulated signal;
a clock coupled to the amplitude modulator having a frequency that determines the frequency of the amplitude modulator, said frequency of the clock being phase locked and equal to said predetermined frequency;
an optical transmission path coupled to said transmitter; and
a receiver coupled to the optical transmission path.

30. The transmission system of claim 29 further comprising:
means for measuring a predetermined characteristic of an optical signal received by the receiver;
means for transmitting the predetermined characteristic to the transmitter; and
means for selectively varying the phase of the amplitude modulation imparted to said data modulated signal to optimize the value of the predetermined characteristic.

31. The transmission system of claim 30 further comprising a polarization modulator coupled to said amplitude modulator and said clock for modulating the state of polarization of the optical signal at said predetermined frequency such that an average value of the state of polarization over a modulation cycle is substantially equal to zero; and

32. The system of claim 31 wherein said polarization modulator modulates the state of polarization by tracing the polarization of said optical signal along at least a portion of a Poincaré sphere.

33. The system of claim 31 wherein the polarization modulator modulates the state of polarization of the optical signal at said predetermined frequency with a prescribed phase, and further comprising an electrical variable-delay line coupling said clock to said polarization modulator for selectively varying the prescribed phase.

34. The system claim 33 wherein said electrical variable-delay line is a phase shifter.

35. The system of claim 31 further comprising an optical phase modulator coupling the optical signal source to the amplitude modulator, said optical phase modulator providing optical phase modulation to said data modulated signal while imparting substantially no polarization modulation thereto..

36. The system of claim 35 wherein said clock is coupled to said optical phase modulator so that said optical phase modulator provides optical phase modulation at a frequency that is phase locked and equal to said predetermined frequency.

37. The system of claim 36 further comprising a second electrical variable-delay line coupling said clock to said optical phase modulator for selectively varying the phase of said optical phase modulation provided by the optical phase modulator.

38. The system of claim 37 wherein said second electrical variable-delay line is a phase shifter.

39. The transmission system of claim 38 wherein said predetermined characteristic is the signal-to-noise ratio of the optical signal received by the receiver.

40. The transmission system of claim 39 wherein said predetermined characteristic is the Q-factor of the optical signal received by the receiver.

41. The apparatus of claim 1 wherein said amplitude modulation imparts sinusoidal modulation to said data modulated signal.

42. The apparatus of claim 14 wherein said amplitude modulator imparts sinusoidal modulation to said data modulated signal.

43. The method of claim 25 wherein said amplitude modulation imparts sinusoidal modulation to said data modulated signal.

44. The apparatus of claim 29 wherein said amplitude modulation imparts sinusoidal modulation to said data modulated signal.